10 CADASTRE 2014 IN RELATION TO SPATIAL DATA INFRASTRUCTURE (SDI)

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20 years ago, CADASTRE 2014 provided a simple yet effective framework for supporting the evolution of cadastral systems for the future. With the relationship between cadastres and spatial data infrastructures (SDIs) formally recognised by the Bogor Declaration, it was inevitable that CADASTRE 2014 would impact upon SDIs as well. SDIs have emerged as both a fundamental network infrastructure, as well as an enabling platform to help achieve the vision of a spatially enabled society as it aims to connect people to data to facilitate decision-making. In this context SDIs together with land administration, which typically generates information about places, can provide the unique ability to produce important and fundamental information about the places people create and use – the cornerstone for supporting the development of a spatially enabled information environment. The emphasis of CADASTRE 2014 on information integration and shifts in collaboration dynamics across stakeholders carved a greater role for SDIs in connecting people and data.

The realisation of spatially enabled societies has been driven by the cadastre providing a foundation in land and property information and SDIs providing an enabling platform for facilitating location-based information and services – together, they present a powerful paradigm for building capacity for addressing the global agenda and achieving sustainable development goals.

Introduction

The publication of CADASTRE 2014 provided a framework comprising six statements that aimed to provide a model for cadastral development that was anticipated to be sufficiently robust as to meet the needs of the future.

This framework essentially established a set of universal principles that all countries could work towards, and indeed, continue to aspire to do so even till this day. The importance of CADASTRE 2014 cannot be overstated within the domain of land administration; however, given that the cadastre underpins fundamental information about land and property for every nation, its impact has been far-reaching. With a formal relationship between cadastres and SDIs endorsed by the Bogor Declaration on Cadastral Reform in 1996, it was inevitable that CADASTRE 2014 would impact on the function of SDIs. This section considers the impact of CADASTRE 2014 in relation to spatial data infrastructures, and their twin roles in helping to realise spatially enabled societies. Particularly the relationships between cadastre and SDI have been well presented in the diagram showing the significance of the cadastre, and it is called “butterfly diagram” (Williamson et al., 2010), which shows the cadastre as the engine of LAS that forms a key component within the SDI as it supports the land administration functions for delivery of sustainable development. Once the cadastral data (cadastral or legal parcels, properties, parcel identifiers, buildings, legal roads, etc.) is integrated within the SDI, the full multipurpose benefit of LAS, so essential for sustainability, can be achieved.
**SDI as a network and an enabling platform**

The creation of economic wealth, social stability and environmental protection objectives can be facilitated through the development of products and services based on spatial information collected by all levels of societies including governments, private sectors, and citizens. In this context, spatial data and information, land administration, land management, and land governance play crucial roles in this.

With this in mind, since the early 1990s, the concept of a spatial data infrastructure (SDI) has progressively entered into the lexicon of governments all around the world and gained an increasingly prominent profile as an enabling infrastructure, critical to development by linking information to location. The SDI concept facilitates the sharing, access and utilisation of spatial data across different communities to better achieve their objectives. It has emerged as a key network infrastructure, which provides a mechanism to facilitate the integration of cadastral and topographic data to support decision-making.

As the concept of SDIs gained traction, the concept has evolved to the extent that SDIs are now regarded more as an enabling platform: an integrated, multi-level hierarchy of interconnected SDIs based on partnerships at corporate, local, state/provincial, national, multi-national (regional) and global levels. This has enabled effective management, networking and sharing of spatial information and services across agencies and even national boundaries, which has resulted in information being used more efficiently and effectively, enabling users to save on resources, time and effort when seeking to acquire new datasets by avoiding expenses associated with duplications in the generation and maintenance of data; as well, their integration with other datasets has led to the creation of new services.

SDIs are now being used in many different capacities – particularly in the coordination, analysis and use of large-scale, people relevant data. Indeed, the importance of this relationship was underscored in the Bogor Declaration on Cadastral Reform in 1996, which stated that the spatial cadastral framework – usually a cadastral map – should be a fundamental layer within a national SDI (FIG, 1996). Land administration typically generates information about places while SDIs organise spatial information. CADASTRE 2014 emphasised information integration and shifts in collaboration dynamics across stakeholders – key aspects that SDIs have become well regarded for. Together, they can provide the unique ability to produce important and fundamental information about the places people create and use – the cornerstone for supporting the development of a spatially enabled information environment.

**Spatially Enabled Societies**

Spatial enablement is a concept that adds location to existing information, thereby unlocking the wealth of existing knowledge about land and water, its legal and economic situation, its resources, access, and potential use and hazards. It uses the concept of place and location to organise information and processes and is now consistently part of broader government strategies. This promotes innovation, transparency and democracy by enabling citizens and we are therefore, potentially at the start of a spatial information revolution. Societies and their governments need to become spatially enabled in order to have the right tools and information at hand to take the right decisions. The concept of Spatially Enabled Societies (SES) is offering new opportunities for government and the wider society.
At its heart, the concept of SES depends on the effective use and delivery of data and services. This effectiveness is a consequence of legislation that mandates its use, and implicitly deals with issues of data quality and liability (Onsrud, 2010). One of the ways in which an SDI, as an enabling platform, can support the legal framework is to provide an avenue for governance.

In considering the role of governance as applied to SDIs, Box and Rajabifard (2009) highlighted the importance of considering the nature of SDIs to arrive at a more appropriate conceptualisation of governance. They noted that governance is traditionally considered a ‘steering’ function because it provides leadership and an enabling framework for collective decision-making; however, as applied to SDI, governance has become shorthand for the institutional arrangements that enable an SDI, and therefore includes functions such as co-ordination and management. These ‘rowing’ functions extend the scope of governance to include decision implementation. Governance plays a central role in SDI, and therefore SES, by enabling the creation of agreements that bind together the people and geospatial resources (data and technology) involved. A range of other functions are however necessary to channel collective efforts towards common goals.

SES is one that makes use, and benefits from, a wide array of spatial data, information, and services as a means to organise its land and water related activities. SES is now part of the objectives of governments in many countries, highlighting the importance of spatial information and strategies in policy development and decision-making in the public sector. SES increasingly operates in a virtual world but they need to be coupled with real world institutional and structural reforms in the use of spatial information and SDI as an enabling platform.

Land Administration Systems underpin efforts to realising Spatially Enabled Societies

Land Administration Systems (LAS) including cadastre as a base and core component enable the management of land information, which is fundamental for informing decisions about economic, environmental and social issues of priority. In today’s modern society, LAS also underpins efforts in realising SES, where location and spatial information are regarded as common goods and made available to citizens and businesses to encourage creativity and product development.

Developments in LAS, and consequently momentum behind SES, have only been possible due to the increasing ubiquity of spatial data and location information. This ubiquitous characteristic is reliant on a variety of technical infrastructure not only for dissemination and use, but for supporting the entire lifecycle of spatial information. Fundamental to the genesis of any type of spatial information is the accuracy and reliability of the positioning network. Many jurisdictions have adopted satellite-based position to improve accuracy and transparency in their LAS but there are still challenges that need to be overcome such as applicability in built environments, and more integrated information to deliver a better-connected government and society. As well, research into different dimensions and utilisation of positioning including 3D land and property management and indoor positioning are providing new aspects to LAS, improving its relevance to modern land administration requirements.

There are six fundamental elements which have been introduced as the requirements to realize the vision of a SES (Steudler and Rajabifard, 2012). These elements are un-
derpinned by the CADASTRE 2014 model, which was originally proposed for cadastre development. This is one of the impacts of CADASTRE 2014 on the evolution in how we manage our land and property information. Without these elements, progressing the spatial enablement of a society or government would be seriously curtailed.

These elements for the delivery of SES are: a legal framework to provide the institutional structure for data sharing, discovery, and access; a sound data integration concept to ensure multi-sourced data integration and interoperability; a positioning infrastructure to enable and benefit from precise positioning possibilities; a spatial data infrastructure to facilitate data sharing, to reduce duplication and to link data producers, providers and value adders to data users based on a common goal of data sharing; land ownership information, as the dominant issue in the interactions between government, businesses and citizens relating to land and water resources; and data and information to respect certain basic principles and to increase the availability and interoperability of free to re-use spatial data from different actors and sectors.

**Looking to the future**

Advances in ICT and, in particular, in mobile communications and devices have vastly improved the efficiency and use of spatial information. And yet, ongoing research shows there is still much progress to be made, even as we simultaneously continue to establish new developments in positioning technology. There will be ongoing chal-
lenges in communicating these developments to users and helping them to interpret and understand this information to facilitate their purposes and also to maximise the return of their investments and realisation of SES.

In this move towards SES, SDIs have become a key infrastructure. However, the realisation of spatial enablement is still being impacted by the existence and perpetuation of data silos both within, and between, organisations that contribute to SDI initiatives. This makes the discovery, access, use and sharing of spatial data and services still a significant challenge. More recently, the convergence of many economic, social and environmental drivers with location has provided spatial enablement with an increasingly prominent profile both on local and global stages. In light of the emerging importance of location as the fourth driver in decision-making, alongside the role of the cadastre and land administration in spatial enablement, there is also a continued need for good land governance to facilitate spatially enabled governments, so as to build capacity for addressing the global agenda as well contributing to the primacy of spatially enabled governments in achieving sustainable development and a spatially enabled society.

To this end, CADASTRE 2014 has been an important platform in helping to shape the future of SES, in particular in shaping the cadastre as a foundation for modern land administration systems and as an important component for SDI and the basis for the delivery of SES as illustrated in Figure 20. On the event of its twentieth year since conception, I wish the driving team the very best and continued success in its endeavours.

References


